Project Title:
Experimental and Modeling Studies of Potential Gravity Wave Seeding of Plasma Dynamics at Equatorial Latitudes

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Project Information:
Atmospheric gravity waves (GWs) have been suggested for many years to play a role in seeding Rayleigh-Taylor instability, equatorial spread-F (ESF), and plasma bubbles penetrating to high altitudes. But despite numerous modeling studies and measurements suggesting such a role, no definitive experiments have occurred. Our goal is to combine comprehensive ground-based optical and radar instrumentation, in situ and nadir imaging satellite observations, and modeling of GWs arising from tropical convection and their propagation to high altitudes to document such seeding, if it occurs, and to assess the geophysical conditions favoring seeding and controlling GW influences on ESF and bubble statistics and morphology. Our research team represents a collaboration between three research groups and two satellite PIs who will jointly perform two measurement programs in Brazil coordinated with TIMED and ROCSAT-1 or C/NOFS. Our method will be to observe GWs arising from deep convection in central and eastern Brazil as they propagate through the mesopause and into the thermosphere, to measure the responses in the bottomside F layer, and to correlate these responses with satellite and radar observations of ESF and bubble structures at greater altitudes. Modeling efforts will assess and confirm the links between GW sources and ionospheric effects.

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